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(56) Documents cited  
None

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**(58) Field**

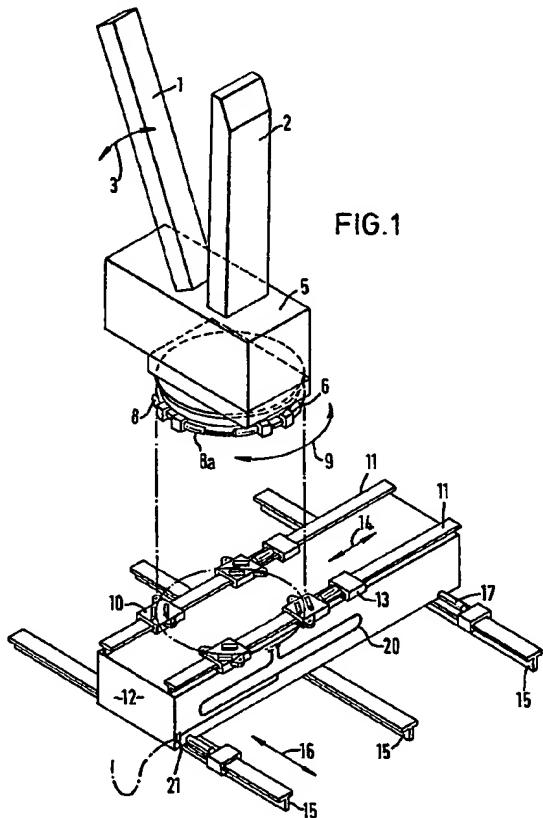
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#### (54) Drilling rigs

(57) A drilling rig comprises a drilling mast (1, 2) supported on a turntable, which turntable is mounted for translation along a support structure comprising at least one elongate guide track (11), the turntable comprising a circular guide track (6) which crosses said elongate guide track (11) and is slidably engaged thereto at said crossing by a slide block (10) slidably engaged with said elongate guide track and with which said circular guide track is slidably engaged. Generally there are at least two substantially parallel elongate guide tracks (1) crossed by said circular guide track (6), the circular guide track being engaged to each elongate guide track by a similar slide block (10) at each crossing point.

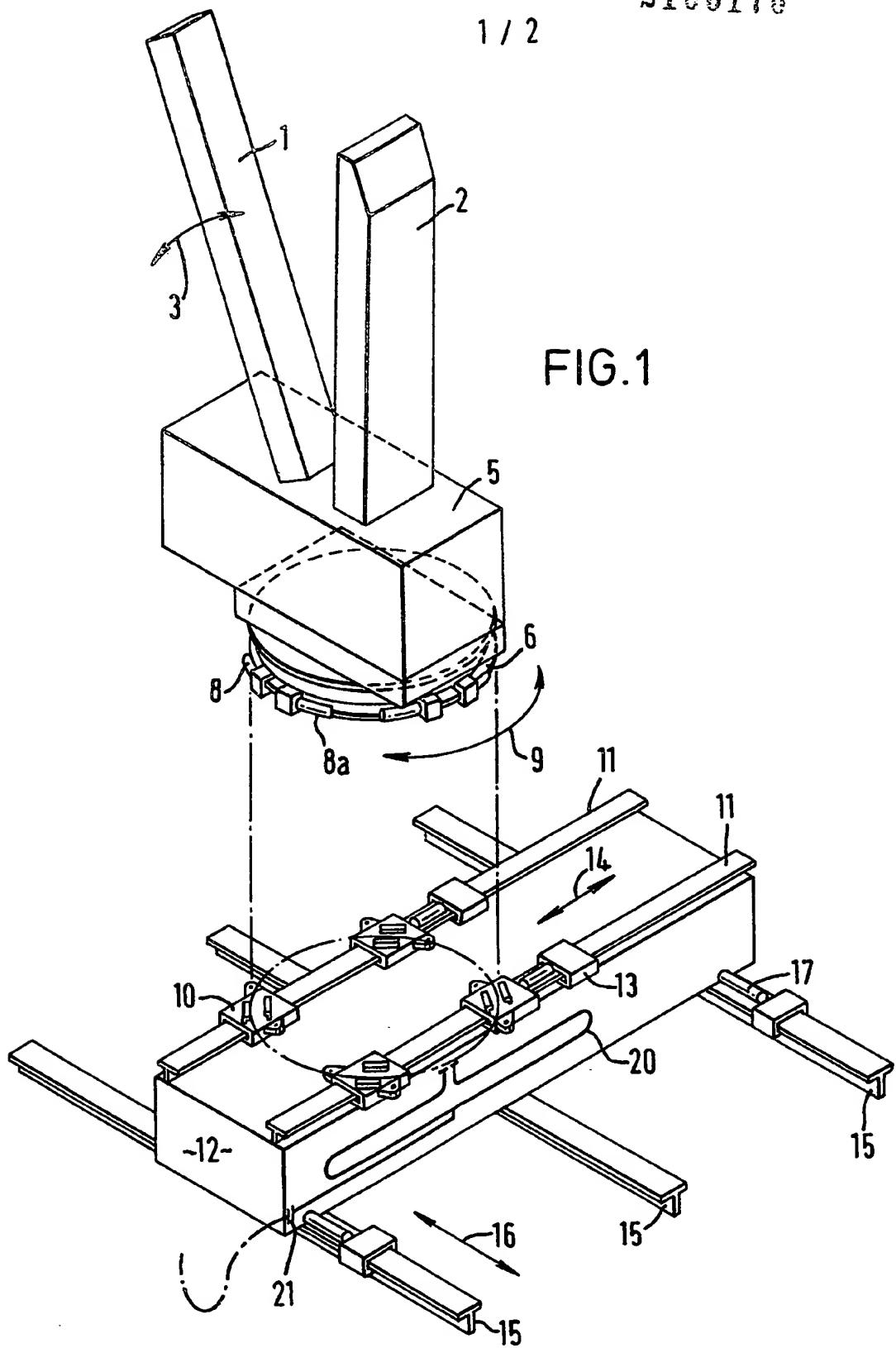


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FIG.1



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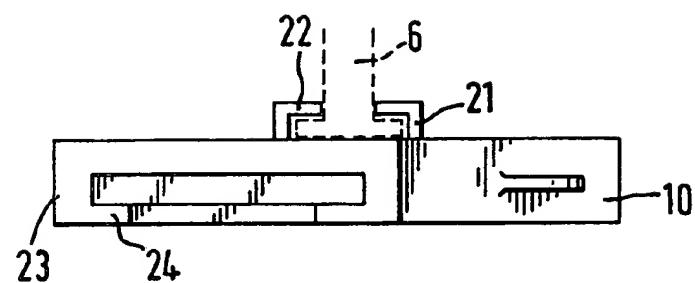


FIG. 2

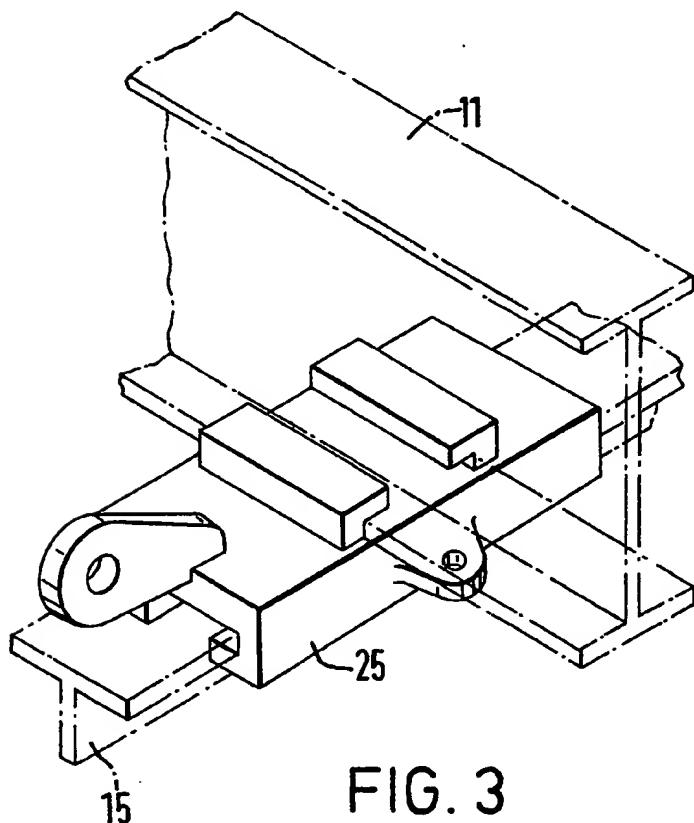


FIG. 3

## SPECIFICATION

## Drilling rigs

5 The present invention relates to drilling rigs, and has particular, thought not exclusive, application to offshore oil and gas drilling rigs.

In drilling rigs of this kind it is quite common for a number of shafts or bores to be sunk from a single 10 platform, utilising the same drilling mast. Typically, for example, 16 bores may be sunk from a single platform, by positioning the drilling mast at four angular orientations at each of four respective corners of a generally rectangular drilling platform. In order 15 that the drilling apparatus is generally within the protective envelope defined by the legs of the drilling rig, it is common practice for the four orientations to be in a fan shape generally towards the centre of the drilling platform.

20 Rotating conventional drilling masts at the four corners of the rig is a very difficult and time consuming process, and can typically involve as many as fifty separate and jacking operations.

Our copending patent application No. 2139267 25 describes an improved drilling rig adapted to enable the translocation and rotation of the drilling mast of the rig for the drilling of such multiple shafts or bores to be performed in a convenient manner.

The present invention relates to a further improvement 30 in such systems.

In the embodiment described in the above mentioned application, a tiltable drilling mast is supported on a turntable formed by a pair of super imposed circular skid rails. The lower of the skid rails 35 is carried by a transverse skid base which in turn rests upon and is slidable along a pair of elongate parallel skid rails.

now been appreciated that the system can be simplified, particularly in regard to the presence of the 40 transverse skid base.

The present invention provides a drilling rig comprising a drilling mast supported on a turntable, which turntable is mounted for translation along a support structure comprising at least one elongate guide track, 45 wherein the turntable comprises a circular guide track which crosses said elongate guide track and is slidably engaged thereto at said crossing by a slide block slidably engaged with the said elongate guide track and with which said circular guide track is slidably 50 engaged.

Preferably there are at least two substantially parallel elongate guide tracks crossed by said circular guide track, the circular guide track being engaged to each elongate guide track by a similar slide block at 55 each crossing point. Preferably there are two such elongate guide tracks. There will not normally be any need to have more than three.

Preferably, to enable translocation of the drilling mast in a second direction orthogonal to that provided 60 by the above mentioned elongate guide tracks, the arrangement is such that said elongate guide track or tracks extend in a first direction along the support

structure and the support structure is itself supported for sliding movement along at least one elongate guide track extending in a second direction substantially at right angles to said first direction.

Said support structure may optionally be composed of a plurality of slide blocks fixed to the first direction elongate guide tracks and slidable along said second direction elongate guide track or tracks.

More generally however it is preferred that the support structure is engaged with said second direction guide track or tracks at each crossing point by a slide block element fixed to the support structure and slidable along the respective second direction guide track.

Preferably there are at least two second direction guide tracks. It will not be necessary generally to have more than three.

80 Preferably the circular and elongate guide tracks take the form of skid rails, for instance of I-section. Where the skid rails are of I-section or of another section having a T-shaped portion, the skid block has a correspondingly shaped channel therethrough which wraps around and positively engages the T-shaped portion of the skid rail.

Preferably, there is associated with at least selected slide blocks or slide block elements a gripper jack for gripping a guide track adjacent the slide block or slide block element and for moving slide block or slide block element along the guide track gripped.

90 Preferably there are a pair of gripper jacks associated with each slide block engaging the circular guide track to the elongate guide track or tracks on which it is supported, each jack of each such pair being for rotating the turntable in an opposite sense to the other jack.

Alternatively, fewer jacks may be used. For instance 100 a pair of gripper jacks may be positioned substantially at opposite ends of a diameter of said circular guide track engaging respective slide blocks and arranged to rotate said circular guide track in opposite directions.

Preferably a drag chain is provided for supplying services to the turntable. Preferably a drag chain is 105 provided for supplying services to the support structure.

The invention includes a method of operating a drilling rig as described above which method comprises translating the turntable supporting the drilling mast along the elongate guide track or tracks from a first drilling position to at least one further drilling position, rotating the drilling mast on the turntable to a plurality of orientations at each of the said drilling positions, and drilling a respective shaft at each of the 110 said orientations.

Preferably, four shafts are drilled from each of at least four positions.

Preferably, the drilling rig includes said second 115 direction elongate guide track or tracks and the support structure is translated along said second direction track or tracks in order to reach further positions. Preferably, the drilling positions are at the four respective corners of a generally rectangular support platform of a drilling rig.

The term "turntable" as used herein is intended to mean any structure capable of supporting the mast, and having a generally circular component permitting rotation of a mast about a substantial vertical axis, and 5 is not intended to imply the need for any complex bearing arrangement or the like. Indeed, in its simplest embodiment, a turntable consists simply of a singular circular rail, upon which the drilling mast and its associated support structure is fixed, the circular rail 10 being slid in said slide blocks.

The invention will be illustrated by the following description of preferred embodiments thereof with reference to the accompanying drawings in which Figure 1 shows a schematic diagram of a drilling rig 15 according to the invention, Figure 2 shows a slide block of the rig shown in Figure 1 in corner elevations. Figure 3 shows a slide block for use in a modification of the embodiment shown in Figure 1.

As shown in figure 1, a drilling rig according to the 20 invention comprises a drilling mast (1,2) of conventional form so constructed and arranged as to be capable of having a part (1) thereof tilted from vertical as shown by arrow (3) so that it can be used for drilling at an angle to the vertical. Other parts of the mast not 25 required to tilt in the operation of drilling at an angle are schematically indicated by the vertical column (2).

The tiltable mast (1) is supported on a mast support platform (5). The base of the mast support platform is fixed to a circular skid rail (6), which may be for 30 example of I-section, thus having at its lower face a horizontally extending flange extending outwardly and inwardly of the circle either side of the central web of the I. This lower flange is received in channels defined between pairs of upstanding lugs on the 35 upper surface of four slide blocks (10). Each slide block (10) is slidable along an elongate guide track in the form of a skid rail (11). There are a pair of skid rails (11) which suitably extend from one side to the other of a drilling platform of the rig. The structure of the slide 40 blocks (10) is most clearly seen in Figure 2. The slide block (10) seen in corner elevation in Figure 2 comprises a pair of upstanding lugs (21) on the top surface thereof extending parallel to one another diagonally across the top surface of the slide block 45 (10). A horizontally extending lip (22) is provided along each lug (21) thus providing a relatively wide channel between the lugs (21) beneath the lips (22) for receiving the flanges of the I-section skid rail (6) shown dotted in Figure 2. The slide block (10) further 50 comprises depending side portions (23) and inwardly extending wall portions (24) extending towards one another beneath the top surface of the slide block to form a further T-shaped channel in which is received the flange of the T-shaped skid rail (11).

55 Gripper jacks (8 and 8a) are provided arranged to act between the slide blocks (10) and the circular skid rail (6). The jacks (8 and 8a) are arranged to act in opposite directions against their respective slide block (10). Each jack (8 or 8a) is an hydraulic jack adapted to grip 60 the skid rail and press against the respective slide block. By actuation of the appropriate jacks (8 or 8a) the drilling mast may be rotated on its skid rail about a vertical axis as shown by arrow 9.

Similar hydraulic gripper jacks are provided in 65 engagement with rails (11) acting against the slide blocks (10). By means of these jacks the slide blocks (10) carrying the turntable may be translated along the slide rails (11) so that the mast may be moved from side to side of the drilling platform as shown by arrow 70 14.

The slide rails (11) are carried by an intermediate support platform (12) which is itself carried by skid rails (15) which extend at right angles to skid rails (11), e.g. from end to end of the drilling platform of the rig. 75 Gripper jacks (17) are provided acting between the skid rails (15) and the intermediate support platform (12) to enable the mast and the intermediate support platform (12) to be translated along the rails (15) in the direction shown by the arrow (16). As shown, there are 80 three rails (15). However, more or fewer such rails may be provided.

Services such as mud, cement, electricity, and the like are conducted to the mast by means of a drag chain (20). A junction (21) is provided to enable the 85 services to be supplied to the drag chain (20) on the movable intermediate platform (12). These services may be fed to the junction (21) by means of a conventional trailing catenary.

Connection of services from the transverse skid 90 base (10) to the mast support platform (5) may be by means of a special form of drag chain, having a construction such that it will assume a coiled shape, and thus follow rotary movement of the mast support platform about its vertical axis.

95 Alternatively, a catenary of generally conventional form may be utilised, one end being secured to a support on the intermediate platform (12), and the other end secured to the mast support platform (5). The catenary is simply positioned manually on 100 rotation of the mast support platform.

As an alternative to the skid rails described above, rollers or rails of an alternative sort may be utilised, provided that sufficient locking of the structure is carried out before operation.

105 In typical use, the intermediate platform (12) is first slid along the rails (15), and the intermediate platform is then locked in position by clamps. The turntable on slide blocks (10) is then slid along the skid rails (11) to the desired position, normally one or other corner of 110 the main drilling platform. The slide blocks (10) are then clamped in position over the desired location.

The mast support platform (5) is then rotated on the turntable constituted by the skid rail (6) sliding in the slide blocks (10), utilising the hydraulic jacks (8), until 115 the desired angular orientation is achieved. During this rotation operation, the catenary or other supply for services maintains connection of services with the mast support platform (5).

When the appropriate rotational orientation has 120 been selected, the mast support platform (5) is clamped in position by clamping of the skid blocks (10) and the drilling mast (1) tilted about axis (2) until the required angle to the vertical is achieved.

To produce a second bore at the same position, all 125 that is required is that the mast (1) is first aligned to its vertical position, the clamps between skid rail (6) and the slide blocks (10) are released, the new orientation is achieved using the gripper jacks (8), the rails and blocks (10) are reclamped, and the mast (1) re-tilted. A 130 slight movement in either direction (14) or (16) will in

general also be necessary, to ensure that the new bore does not interfere with pipework associated with the previous bore.

In the modifications illustrated in Figure 3, the 5 intermediate support platform (12) is replaced by four slide blocks (25) to the upper surface of each of which is fixed a skid rail (11). A lower surface of each slide block (25) is provided with a T-shaped channel engaging the upper flange of a respective skid rail (15). 10 In an alternative arrangement, instead of there being two separate slide blocks (25) on each rail (15) an elongate slide block (25) is provided spanning the underneath of the skid rails (11) such that both or all the skid rails (11) are fixed to the upper surface of a 15 single slide block (25) on each rail (15).

Whilst the invention has been described with reference to specific features of the illustrated embodiments, many modifications and variations may be made without the parting from the scope of 20 the invention.

#### CLAIMS

1. A drilling rig comprising a drilling mast supported on a turntable, which turntable is mounted for translation along a support structure comprising at 25 least one elongate guide track, wherein the turntable comprises a circular guide track which crosses said elongate guide track and is slidably engaged thereto at said crossing by a slide block slidably engaged with said elongate guide track and with which said circular 30 guide track is slidably engaged.
2. A drilling rig as claimed in claim 1 wherein there are at least two substantially parallel elongate guide tracks crossed by said circular guide track, the circular guide track being engaged to each elongate guide 35 track by a similar slide block at each crossing point.
3. A drilling rig as claimed in claim 1 or claim 2 wherein said elongate guide track or tracks extend in a first direction along the support structure and the support structure is itself supported for sliding movement along at least one elongate guide track extending in a second direction substantially at right angles to said first direction. 40
4. A drilling rig as claimed in claim 3 wherein said support structure is engaged with said second direction guide track or tracks at each crossing point by a slide block element fixed to the support structure and slidable along the respective second direction guide track.
5. A drilling rig as claimed in claim 3 or claim 4 45 wherein there are at least two second direction guide tracks.
6. A drilling rig as claimed in any preceding claim wherein the circular and elongate guide tracks take the form of skid rails.
- 55 7. A drilling rig as claimed in claims 6 wherein the skid rails are I-section rails or T-section rails.
8. A drilling rig as claimed in claim 7 wherein associated with at least selected slide blocks or slide block elements is a gripper jack for gripping a guide 60 track adjacent the slide block or slide block element for moving the slide block or slide block element along the guide track gripped.
9. A drilling rig as claimed in claim 8 wherein there are a pair of gripper jacks associated with each slide 65 block engaging the circular guide track to the elongate

guide track or tracks on which it is supported, each jack of each such pair being for rotating the turntable in an opposite direction to the other jack.

10. A drilling rig as claimed in claim 8 wherein a 70 pair of gripper jacks are positioned substantially at opposite ends of a diameter of said circular guide track engaging respective slide blocks and arranged to rotate said circular guide track in opposite directions.
11. A drilling rig as claimed in any preceding claim 75 and comprising a drag chain for supplying services to the turntable.
12. A drilling rig as claimed in any preceding claim and comprising a drag chain for supplying services to the support structure.
- 80 13. A drilling rig substantially as hereinbefore described with reference to and as illustrated in the accompanying drawing.
14. A method of operation a drilling rig as claimed in any preceding claim which method comprises 85 translating the turntable supporting the drilling mast along the elongate guide track or tracks from a first drilling position to at least one further drilling position, rotating the drilling mast on the turntable to a plurality of orientations at each of the said drilling positions, 90 and drilling a respective shaft at each of the said orientations.
15. A method of operation a drilling rig substantially as hereinbefore described with reference to and as illustrated in the accompanying drawing.

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